3.8 der of inverse trig functions

inverse < mult. inverse $2^{-1} = \frac{1}{2}$

function inverse $f^{-1}(x) \neq \frac{1}{f(x)}$

$f(x) = \sin x$

function inverse: $g(x) = f^{-1}(x) = \sin^{-1} x$

note: $\sin^{-1} x \neq \frac{1}{\sin x}$, $\frac{1}{\sin x} = \csc x$

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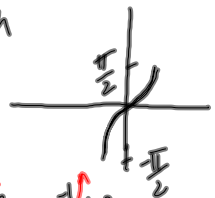
$y = \sin^{-1} x = \arcsin(x)$

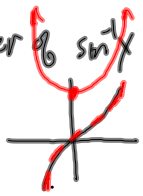
graph 

$\sin^{-1} \frac{1}{2} =$

$\arcsin \frac{1}{2} = 30° \text{ or } \frac{\pi}{6}$

$\tan^{-1} 1 = \frac{\pi}{4}$

der of $\sin^{-1} x$?



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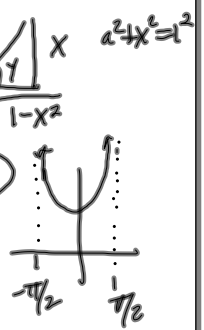
$y = \sin^{-1} x$ find $\frac{dy}{dx}$

same: $\sin y = x$ (1)

diff. $y' \cos y = 1$

$y' = \frac{1}{\cos y} = \frac{1}{\sqrt{1-x^2}}$



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$\frac{d}{dx} \sin^{-1} x = \frac{1}{\sqrt{1-x^2}}$ $\frac{d}{dx} \cos^{-1} x = \frac{-1}{\sqrt{1-x^2}}$

$\frac{d}{dx} \tan^{-1} x = \frac{1}{1+x^2}$ $\frac{d}{dx} \cot^{-1} x = \frac{-1}{1+x^2}$

$\frac{d}{dx} \sec^{-1} x = \frac{1}{|x|\sqrt{x^2-1}}$ $\frac{d}{dx} \csc^{-1} x = \frac{-1}{|x|\sqrt{x^2-1}}$

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$\frac{d}{dx} \sec^{-1}(5x^4) = 20x^3 \cdot \frac{1}{|5x^4|\sqrt{(5x^4)^2-1}}$

out in

$\frac{d}{dx} \sin^{-1}(x^2) = 2x \frac{1}{\sqrt{1-x^4}} = \frac{2x}{\sqrt{1-x^4}}$

$\frac{d}{dx} \tan^{-1}\sqrt{x} = \frac{1}{2}x^{-\frac{1}{2}} \cdot \frac{1}{1+(\sqrt{x})^2} = \frac{1}{2\sqrt{x}(1+x)}$

$\sqrt{x} = x^{1/2}$

$\tan^{-1}\left((x)^{\frac{1}{2}}\right)$

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